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PERMAFROST Overburden Exploration

A vigorous exploration program by United Keno Hill Mines on its Yukon silver properties has revealed new possibilities for the Atlas Copco overburden drilling technique. Here, for the first time, the equipment was used in perma-frost. Meanwhile, at the other side of the world, the same technique is used to define iron ore bodies in Swaziland.

The hills of the Yukon are far removed from the Bomvu Ridge in Swaziland, Africa. Common to both locations during 1963 was the use of the overburden drilling method for mining exploration. In the Yukon, at United Keno Hill Mines, they were seeking silver; in Swaziland, iron.

The application of the overburden drilling method at the United Keno Hill Mines property in the Yukon during the summer and autumn of 1963 revealed impressive possibilities for cost-cutting in the exploration phase of mining. Lending a unique flavor to the operation was the fact that much of the drilling was done in perma-frost, the first recorded use of overburden drilling under these conditions.

Early exploration

The silver mines operated by United Keno were located several decades ago by prospectors who found few outcroppings in the area but an interesting amount of float. This led to a search for the source of ore by digging test pits or shafts, a method that was continued into 1963.

Faced with declining silver production — down for the past year but up sharply in the last quarter — the company launched an aggressive exploration program. Tentative plans call for an extensive drilling program over a three-year span. This prospect, together with the cost of sinking the traditional shafts or digging pits, led the company to pioneer the use of the overburden drilling method in this part of the country. While footage costs have not been revealed, they are admittedly "interesting" and plans call for a continuation of the program using this method in 1964.

Technique

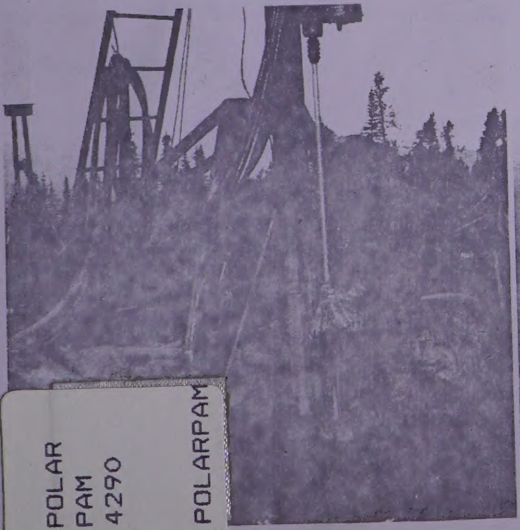
The overburden drilling method, introduced in Canada by Atlas Copco in 1961, is the name given to a technique whereby drilling is carried out through subsoil and boulders — or under water — to and through bedrock. Where applicable, the drilling and blasting is carried out without removing the overburden. The appeal of the system is its flexibility, together with fast and economical penetration rates.

The system has proved versatile in eastern Canada, where it has been used for testing for gravel, blowing the plug at the Manicouagan 2 diversion tunnel, grouting, anchoring and various forms of subsoil investigation. The United Keno application was its first appearance in a major mining exploration role in Canada.

Technical details

The equipment used with the overburden drilling

Overburden drill at work at United Keno. Photo shows device used for trapping samples in first use of equipment for perma-frost exploration.



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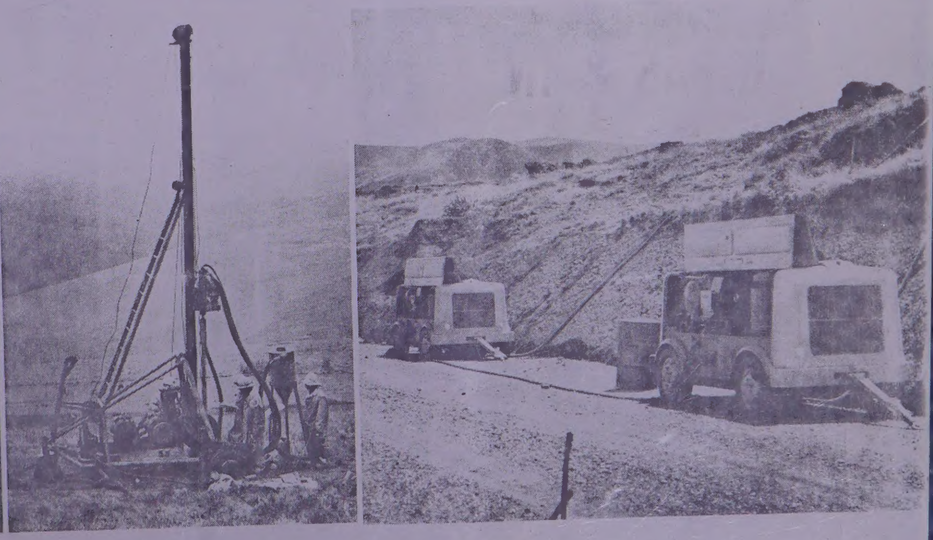
Overburden drilling unit and Atlas Copco compressors, used for Swaziland iron ore sampling. Middle: Rig and device used for collecting samples.



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rig at United Keno included $2\frac{3}{4}$-in. extension pipe with a $3\frac{5}{8}$-in. ring bit; extension rope thread drill steel, 10 ft. long, $1\frac{1}{4}$ in. in diameter, with $1\frac{1}{4}$-in. couplings and 2-in. bits. The rig itself is mounted on a skid base to facilitate movement by a TD20 International tractor.

In the beginning, the company sank the 10 ft. x $2\frac{3}{4}$ in. extension pipe to trap the soil and small quartzite rock inside the pipe. The rock drill and adapter were then disconnected and a 10-ft. drill steel with a 2-in., 4-wing bit was added to the adapter and advanced through the extension pipe, drilling out the hole and blowing the sample up through the pipe for collection and analysis. Then the procedure would be repeated, sinking another 10-ft. length of pipe and drilling it out.

Modified procedure

Later in the season the company discovered it could speed up the process by sinking only one 10-ft. length of pipe, which became embedded in perma-frost. From that point forward, the advance could be carried out with the drill steel and 2-in. bits as the perma-frost held the sides of the hole, permitting the samples to be flushed to the surface without the use of the retaining pipe wall.

To collect the samples, the company designed and built a conical-shaped deflector or umbrella, hinged around the drill steel at the collar of the pipe. From this, the sample is deflected into a sample pan which is also designed to hinge closely around the $2\frac{3}{4}$-in. pipe. This system permitted the collection of samples as the drilling proceeded.

Possible ore shoots

By mid-November, when the overburden drilling sampling was suspended in deference to the onslaught of winter, no new ore bodies had been encountered, but company officials believe that considerable progress has been made in the technique of exploration, particularly in perma-frost. Results are still inconclusive but have indicated the probability of new ore shoots in the area. With certain modifications of the supporting and moving process, it is planned to have the overburden drilling rig operating again in 1964.

Silver to iron

Far away in warm Swaziland, the OD method also is employed for exploration. Here, iron ore is being sampled preparatory to full-scale mining later in 1964. The ore is destined for the blast furnaces of Japan.

An Atlas Copco overburden drilling rig with a BBE51 rock drill began sampling the ore body on the side of Bomvu Ridge early in 1963. Two Atlas Copco PR365 rotary screw compressors, each delivering 365 cfm at 100 psi, are employed to power the rig.

Double-line Sandvik Coromant extension steels are used by the contractors. The casing and inner steel have detachable tungsten carbide bits. Exploratory holes range in depth from 85 to 200 ft. Samples are taken on an average of every 5 ft. by removing the steel but leaving the drill pipe down the hole. A venturi fitted to the top of the pipe forces air into the hole. Material from the bottom is blown to the surface and caught in a cyclone which feeds it into a plastic bag for laboratory analysis.

A long-necked bird

Land-locked Swaziland is located at the northeast corner of the South African province of Transvaal. The technical assistance and Atlas Copco equipment were supplied by Delfos and Atlas Copco (Pty.) Ltd. of South Africa.

One South Africa-based Atlas Copco engineer, driving up the winding, mist-swept road to the Bomvu Ridge in search of the drilling rig, remembers the experience this way:

"Somewhere on the top of the ridge we gave up. Defeated, downhearted, damp. But when we switched off the car engine, we heard a sound which was music in our ears — a symphony which lifted high our hearts.

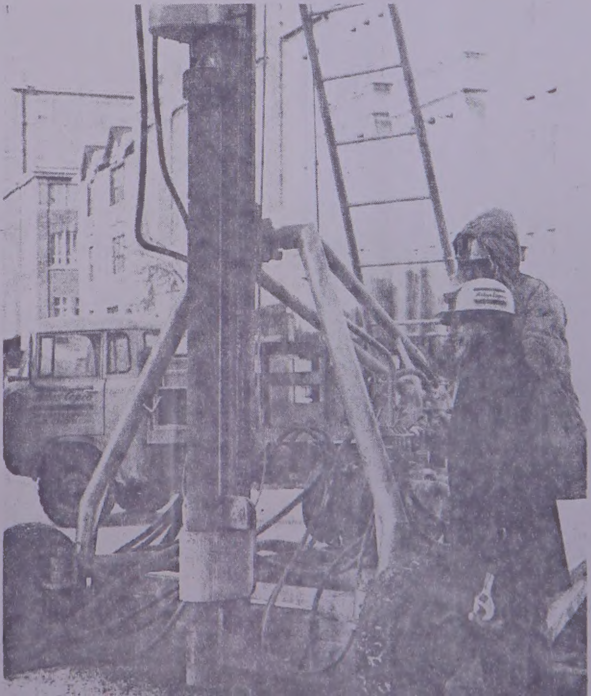
"It was the whine of an air motor. The OD rig no longer was an allegation but a proven fact. We stepped out of our car and froze. Even the cans of beer we had thoughtfully provided for a friend had an inviting frost on them.

"It was only when we were 10 ft. from the source of the music that we saw it looming out of the mist, perched on the hillside like some prehistoric, long-necked bird.

"Three hours later the mist cleared sufficiently for us to take a couple of pictures, before retiring to a cosy log fire in a timbered pub."

In Swaziland, or the Yukon, the scene sounds inviting.

Close-up of the Atlas Copco overburden drilling rig rushed into service at -15°F. when an earth fall in Montreal's subway tunnel at the corner of St. Luke and Closse streets threatened a surface cave-in.



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